

Application No.: 10/696,591
Filing Date: October 28, 2003

REMARKS

Claims 1-13, 15-16 and 18-34 are pending in the present application. Claims 1, 10, 18 and 26 have been amended, and Claim 17 has been canceled. Amendments to the claims are supported in the Application as filed, for example, in paragraph [0026] of the Application. Thus, no new matter has been added.

Allowable Subject Matter

Claim 21 has been objected to as being dependent upon a rejected base claim but deemed allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. Applicants thank the Examiner for allowable subject matter but respectfully refrain from rewriting Claim 21 at this time in view of the allowability of the other claims, as discussed below.

Claim Rejections Under 35 U.S.C. §102

Claims 1-3, 6-7, 10, 22 and 24 were rejected under 35 U.S.C. §102(b) as being anticipated by Gordon et al. (WO 02/27063). This rejection is traversed.

On page 1 of the Office Action, in response to Applicants' previous arguments, the Examiner alleges that because Gordon et al. provides a laundry list of compounds that can be used in ALD *or* CVD of metal silicates, phosphates *or* oxides, Gordon et al. necessarily discloses a process for producing a bismuth-containing oxide thin film by ALD and accordingly discloses all the limitations recited in independent Claim 1. Applicants continue to disagree and maintain that Gordon et al. fails to disclose ***bismuth oxide films*** or layers, and further fails to specifically disclose ***ALD*** of bismuth oxide films or layers. While Gordon et al. generally refers to the ALD *or* CVD formation of metal silicates, phosphates *or* oxides, Gordon et al. only lists ***two bismuth compound precursors***, $\text{Bi}(\text{N}(\text{SiMe}_3)_2)_3$ and $\text{Bi}(\text{N}(\text{Me})(\text{SiMe}_3))_3$, in Table 1, along with almost 150 other volatile metal or metal amides from various sources of literature as "examples" of volatile compounds (*see* p. 16, lines 1-3). There is no direct teaching in Gordon et al. that these two compounds are used to deposit ***bismuth oxide*** by ALD, no teaching of the particular reactions conditions that could be used for depositing bismuth oxides by ALD, and no suggestion of how the disclosed processes could be adapted to deposit bismuth oxides by ALD. The skilled

artisan would understand that the suggestion in Gordon et al. that the listed compounds can be used in ALD *or* CVD of a variety of different materials does not teach that each and every compound can be used in ALD *and* CVD of every type of material. Thus, Gordon et al. cannot anticipate the pending claims.

Nevertheless, to facilitate prosecution, Applicants have amended Claim 1 to indicate that "the bismuth-containing oxide thin film is deposited at a temperature of less than about 250°C." There is no disclosure in Gordon et al. of the deposition of any film "at a temperature of less than about 250°C." Indeed, the Examiner concedes on page 11 of the Office Action that Gordon et al. fails to disclose this feature. Since there is no teaching or suggestion in Gordon et al. of the above limitation, Applicants respectfully request withdrawal of the rejection 35 U.S.C. §102 to independent Claim 1 as amended, and the claims that depend therefrom.

Similarly, Claim 10 has been amended to recite that "the bismuth oxide layer is deposited at a temperature of less than about 250°C." Since there is no teaching or suggestion in Gordon et al. of these limitations, Applicants respectfully request withdrawal of the rejection to independent Claims 10 as amended, and the claims that depend therefrom.

Claim Rejections Under 35 U.S.C. §103

Claims 4, 8, 9 and 23 have been rejected as obvious in view of Gordon et al. Claims 5, 11-13, 15-20, 25-27 and 31-33 have been rejected as unpatentable over Gordon et al. in view of Hintermaier et al. Claims 28-30 have been rejected as unpatentable over Gordon et al. in view of Hintermaier et al. and further in view of Kil (2003/0124875). These rejections are traversed.

As set forth above, there is no direct teaching in Gordon et al. of the ALD formation of a bismuth oxide, as recited in Claims 1, 10 and 26, since Gordon et al. merely discloses two bismuth precursors in a list of volatile compounds. Moreover, Gordon et al. fails to disclose ALD formation of a bismuth oxide film or layer "at a temperature of less than about 250°C," as recited in amended Claims 1, 10 and 26. Applicants submit that Hintermaier et al. fails to cure these deficiencies, since there is no teaching or suggestion anywhere in Hintermaier et al. of an ALD process for forming bismuth oxides, or an ALD process for forming bismuth oxides at a temperature of less than about 250°C. Indeed, Hintermaier et al. only discloses *CVD processes* for depositing bismuth-containing thin films. (See, e.g., Abstract).

Applicants note that in rejecting Claim 17, the Examiner alleges that since Hintermaier et al. discloses substrate temperatures lower than 400°C, “in order *to control the decomposition* mechanism of the bismuth amides on the substrate,” it would have been obvious to modify Gordon et al. to include a substrate temperature of less than 250°C “in order to control the mechanism of the surface reaction to be a *favorable decomposition* mechanism of the bismuth amides and subsequent deposition of bismuth oxides” (Office Action, page 11, emphasis added). Applicants respectfully disagree and submit that the skilled artisan would not have modified the teachings of Gordon et al. to arrive at depositing bismuth oxides by ALD “at a temperature of less than about 250°C” as recited in amended Claims 1, 10 and 26.

Specifically, the CVD process of Hintermaier et al. works on very different principles from the ALD process disclosed in Gordon et al. The Abstract of Hintermaier et al. specifies that CVD deposition is based on the *decomposition* of precursors at the substrate surface. Indeed, the Examiner even alleges on page 11 of the Office Action that Hintermaier et al. teaches temperature conditions to *favor or control decomposition*. In contrast, ALD involves depositing a layer upon a substrate through alternating, self-limited and saturating surface reactions. (See, e.g., page 23, lines 7-14, and page 27, line 23 to page 28, line 12 in Gordon et al.). *Decomposition is avoided* in ALD processes in order to achieve self-limiting surface reactions. For example, paragraph [0026] of the present Application specifically teaches that in ALD conditions in the Areaction chamber are adjusted such that “physisorption...and thermal decomposition of the reactants are avoided,” and that “[c]onsequently, only up to one monolayer (i.e., an atomic layer or a molecular layer) of material is deposited at a time during each pulsing cycle.”

Thus, Applicants submit that the skilled artisan would *not* have combined the teachings of Gordon et al. and Hintermaier et al. to arrive at ALD methods for forming bismuth oxide “at a temperature of less than about 250°C.” That is, the skilled artisan would not have combined Hintermaier’s teachings of temperature ranges for CVD methods, for promoting *favorable decomposition* of reactants, with the ALD methods disclosed in Gordon et al. that specifically *avoid decomposition* in order to be self-limiting. In fact, Hintermaier et al. actually *teaches away* from the ALD methods of forming bismuth oxides recited in independent Claims 1, 10 and 26, as amended, because it suggests that precursors would decompose at the recited temperatures.

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Without a reason to combine the teachings, a *prima facie* case of obviousness is not established with respect to the combinations recited in independent Claims 1, 10 and 26. The Court in *KSR* stated that “there must be *some articulated reasoning with some rational underpinning* to support the legal conclusion of obviousness.” (*KSR*, 550 U.S. at ___, 82 USPQ2d at 1396 quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006) (emphasis added)). However, Applicants submit that there is *no reason* to modify the disclosure of Gordon et al., or to combine the disclosures of Gordon et al. and Hintermaier et al., to form bismuth oxide films by ALD methods “at a temperature of less than about 250°C” as recited in Claims 1, 10 and 26.

Moreover, Applicants note that there must be a reasonable expectation of success in the alleged combination to support a conclusion of obviousness. (See MPEP 2143.02 and cases cited therein). However, because the ALD process disclosed in Gordon et al. *avoids decomposition* while Hintermaier et al. teaches that the disclosed reactants will *decompose* at temperatures of less than 250°C, the skilled artisan would *not have expected success* in the Examiner’s proposed combination.

For at least the forgoing reasons, Applicants submit that independent Claims 1, 10 and 26 as amended are not obvious over Gordon et al. in view of Hintermaier et al. Claims 4-5, 8-9, 11-13, 15-16, 18-20, 23 and 25-33 recite all the limitations of Claims 1, 10 and 26, as well as further distinguishing features. Thus, Applicants respectfully request withdrawal of the rejections under 35 U.S.C. §103.

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No Disclaimers or Disavowals

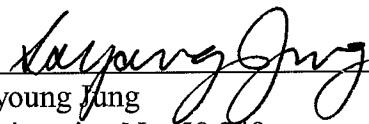
Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, the Applicants are not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. The Applicants reserve the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that the Applicants have made any disclaimers or disavowals of any subject matter supported by the present application.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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Dated: 9/25/08

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